1. Task1. **What database models do you know?**

Hierarchical (tree);

Network (graph);

Relational (table);

Object-oriented;

1. Task2. **Which are the main functions performed by a Relational Database Management System (RDBMS)?**

Represent a bunch of tables together with the relationships between them.

Rely on a strong mathematical foundation: the relation algebra.

Creating/ altering/ deleting tables and relationships between the,(database schema)

Adding, changing, deleting, searching and retrieving of data stored in the tables.

Support for SQL language

Transaction management (optional)

1. Task3. **Define what is "table" in database terms.**

Database table is combination of columns that are defined by some rules.  
For example column ID should be AI integer or some other unique content. Each row of this column should answer these rules. All rows have the same structure. Columns have name and type (number, string, date, image, etc.)

1. Task 4. **Explain the difference between a primary and a foreign key.**

Primary key is key that allows each row from the table to be identified. 50% of the cases this key is AI number, the ID of the row.

The foreign key is an identifier of a record located in another table (using its primary key)

1. Task 5. **Explain the different kinds of relationships between tables in relational databases.**

One-to-many: one row from table can be related to many rows from other table.

Many-to-many: many rows from table can be related to many rows from other table.

One-to-one: only one row from table is related to only one row from other table.

1. Task6. **When is a certain database schema normalized? What are the advantages of normalized databases?**

Normalization of the relation schema removes repeating data. Non-normalized schemas can contain many data repetitions.

1. Task7. **What are database integrity constraints and when are they used?**

Integrity constraints ensure data integrity in database tables. Enforce data rules which cannot be violated. Example human name cannot start with small letter etc.

1. Task8. **Point out the pros and cons of using indexes in a database.**

Indices speed up searching of values in certain column or group of columns. Usually implement as B-trees.

Indices can be build-in the table (clustered) or stored externally (non-clustered)

Adding and deleting records in indexed tables is slower!

Indices should be used for big tables only 50 000 rows ++;

1. Task9. **What's the main purpose of the SQL language?**

Creating, altering, deleting tables and other objects in the database.

Searching, retrieving, inserting, modifying and deleting table data (rows)

1. Task10. **What are transactions used for? Give an example.**

Transactions are a sequence of database operations which are executed as a single unit:

Either all of them execute successfully, or none of them is executed at all.

Example: A bank transfer from one account into another (withdrawal + deposit), if either the withdrawal or the deposit fails the entire operation should be canceled.

1. Task11. **What is a NoSQL database?**

Uses document-based model (non-relational)

Schema-free document storage

Still support CRUD operations

Still support indexing and querying

Still supports concurrency and transactions

Highly optimized for append/ retrieve

Great performance and scalability

1. Task12. **Explain the classical non-relational data models.**

Data stored as table rows

Relationships between related rows

Single entity spans multiple tables

RDBMS systems are very mature, rock solid

1. Task13. **Give few examples of NoSQL databases and their pros and cons.**

Redis: Ultra-fast in-memory data structures server

MongoDB: Mature and powerful JSON-document database

CouchDB: JSON-based document database with REST API

Cassandra: Distributed wide-column database